



Milk in the American Diet: A Paradox but Lots of Promise

AMERICA IS BY FAR the largest milk producer in the world, yet it is not characteristically a nation of milk drinkers. In light of recent disclosures about malnutrition in the United States—not only among the poor who do not have enough to eat, but among the affluent who do not eat wisely—this is a paradox that should be of deep concern to everyone.

The milk, butter, cheese, and other dairy products consumed by the average American during one year amounts to less than 600 pounds (in terms of whole milk equivalency). Finland, whose per-capita consumption is close to 1500 pounds, and 14 of the world's other leading dairy-producing countries are ahead of the United States in this respect. Even the French, the world's most famous wine consumers, drink much more milk than Americans.

Another paradox of this situation is the fact that most children grow up with a real liking for milk. Military installations and colleges serve prodigious quantities of it to young men and women during their first years away from home. But early in adult life a great many people replace milk with some other drink as their beverage of choice.

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Milk's Image

Why is this? Is it because dairy promotions have been aimed too much at extolling the nutritional values of milk? Psychologically, most healthy people recoil from eating things that are "good for them." Emphasis on milk as a builder of healthy bodies and strong bones may have perpetuated its image as a food for infants and growing children. Somehow, milk has never made it as a "sophisticated" drink. The hombre who saunters into a bar in a Western movie and orders a glass of milk is always good for a laugh. The nondrinker often sips ginger ale at a cocktail party, but if he dares to drink milk there he had better be prepared with a good story about his ulcers.

Then, too, milk is not the most widely available beverage. Few vending machines dispense milk, and in many restaurants patrons who prefer milk to coffee or tea must pay a premium for it. Reversing the trend away from milk consumption should be high on the priority list of those concerned with improving the American diet. The main thrust should be aimed at getting people to drink more whole fluid milk. Less than half the milk now sold is consumed in this way, the rest going into other dairy products. The more milk people drink as such, the more fully they will realize its nutritional value and the fewer by-products we will have left over for disposal.

The saturated fats in animal products like milk, have

been implicated in atherosclerosis in recent years. Medical authorities and nutritionists are still debating this point, and the controversy has undoubtedly contributed to the steady decline in milk and butter consumption. If the charge ultimately proves to have some validity, an adjustment in fat intake regarding the saturates and the unsaturates may well be in order. This should not be allowed, however, to overshadow the widely recognized nutritional benefits of milk.

Iron-Fortified Milk

While encouraging a greater consumption of milk, scientists and nutritionists are not overlooking opportunities to improve it still further as a source of nutrients. A few years ago the results of a USDA food consumption survey uncovered deficiencies in iron and calcium, especially in individuals in low-income brackets. The idea of fortifying milk with iron so that this one food would provide both of these nutritional elements was pursued by scientists of USDA's Agricultural Research Service. The big problem, of course, was to add iron without spoiling the flavor of the milk. By using a solution of ferric ammonium citrate or other suitable iron compound they found that milk can be fortified at the rate of 10 milligrams of iron per quart. Objectionable off-flavors would not develop over a storage period of 2 weeks, the maximum life of normally pasteurized milk in the household refrigerator.

Butterfat Utilization

Butter has long occupied a noble place among dairy products. But the popularity of butter has been slipping ever since the days of the depression when economic necessity drove many Americans to substitute alternatives. Dwindling butter consumption and increasing use of skim milk have resulted in frequent accumulations of milk-fat surpluses.

Butterfat, long considered the most valuable constituent of milk and the primary source of its rich, attractive flavor, is no longer the prized commodity that it once was. Emphasis on weight control and the concern of many about the degree of fatty acid saturation, coupled with the lower price of vegetable shortening, have combined to lower the popularity of milk fat among consumers.

Butter today faces stiff competition with the vegetable spreads and shortenings. Furthermore, long-established legal standards promulgated to protect butter from imitation are now making it difficult or impossible for the product to be modified to meet the demands of today's market. For example, mixtures of vegetable fat with butter, or milk fat with margarine, might make highly attractive spreads for consumers demanding more polyunsaturated fats in their diet. But there are at present legal restrictions against marketing such products.

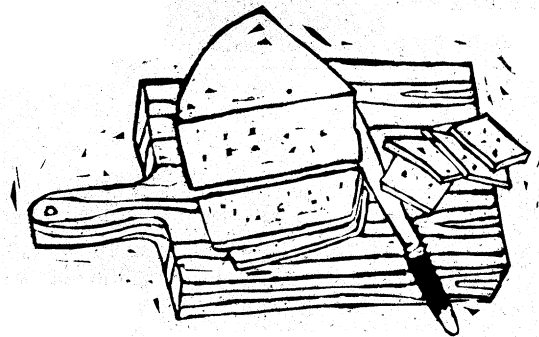
The possibilities for intensifying the rich flavor of milk fat by heating it, thus providing a completely new shortening, are being explored by USDA scientists. Heat-treated butterfat can be used in cooking and in baking to impart an exciting new flavor to many foods. The high cost of this product is likely to limit its wide use, but

its versatility in cooking and baking and as a component of processed foods gives it a promising future.

Cheese and Whey

The large variety of cheese and processed cheese products developed by the American dairy industry has resulted in fast-growing rate of cheese consumption over the past 20 years. Today there is a need for a low-fat cheese that will appeal to the diet-conscious. Scientists of the Dairy Products Laboratory have developed a semi-soft skim milk cheese that looks and tastes like very mild Cheddar. This cheese, which contains only 5 to 7 percent butterfat (compared to the 31 percent normally found in Cheddar), has acceptable body, texture, and flavor for table use. It does lack the creamy softness and rich flavor of Cheddar cheese, but its reception by consumers in sampling tests suggest it should sell well in the diet market. The calories in the skim milk cheese amount to only 185 per 100 grams, compared to 398 for Cheddar cheese.

Like many other industries, the cheese industry has a pollution problem. In manufacturing every pound of cheese, about 9 pounds of a watery substance known as whey is pressed from the curd. Some cheesemakers have found use for their whey as a fertilizer or animal feed, but until recently most of the whey has been discharged into streams. Now Federal and State legislation prevents



whey from being diverted into waterways. Treatment of the whey to reduce its high potency as a waste material is extremely expensive for the thousands of small cheesemakers that are a vital segment of the dairy industry.

Whey is an unusual pollutant in that it is completely edible. Thus whey pollution can, at least in part, be eaten away. Forty years ago, long before the present demand for clean streams, the United States began developing food uses for whey. Today this work has taken on new importance, not just as a means of turning a waste product to profitable use, but as a desperately needed alternative to costly pre-disposal treatment.

Because whey is mostly water, the first step in its efficient use is drying. To the several methods used commonly in the industry, the United States has added a new one—foam-spraying drying. One advantage of this process is that it can be used for drying cottage cheese whey which is so high in acid content that regular commercial processes cannot be used to dry it. Whey powder is now a widely used component of many baked goods, candies, and other food products. The whey contributes good food value to these products and im-

proves their flavor as well.

Whey powder may find important applications as a component of nutritional supplements used to relieve world hunger. In such products it might replace, either in whole or in part, nonfat dried milk. Whey contains valuable proteins and other nutrients. It is as good a source of the B vitamins, especially riboflavin, as milk, and it also provides calcium, phosphorus, and magnesium.

Whey is not, however, the nutritional equivalent of skim milk. It consists mostly of lactose, it is lacking in casein, and the other proteins found in it are different from those that stay in the curd and become components of the cheese.

The lactose in whey represents 72 percent of its solids. To be used as a nutritious food component, at least half of its sugar should be removed to increase the concentration of protein. The lactose removed can still be used as a food or pharmaceutical ingredient.

Many people, mostly non-Caucasians, seem unable to tolerate much lactose in their diet. Their digestive juices lack the enzyme lactase needed to assimilate this sugar. Whether this lack is a genetic characteristic, or simply develops as a result of the absence of milk in the diet since weaning, is not yet known. In any event, if whey powder is to be used as an important component of nutritional supplements, it should not contain excessive amounts of lactose.

Dried Milk Products

With all its values, fresh milk has two limitations: it will not keep, even under refrigeration, much more than a week or two and it is expensive to ship and store. Scientists have shown, however, that milk will keep as long as 20 weeks if it is pasteurized at a higher temperature and stored at or just above freezing. But the most practical way of making milk keep longer, a way that reduces the expense of shipping and sorting it at the same time, is to remove the water.

Nonfat dry milk has long been available and commands a sizable consumer market. In recent years scientists of the Dairy Products Laboratory have demonstrated that their foam-spray drying method makes an improved skim milk powder. This product is used in some commercial chocolate drink powders for the foamy, cream-like surface or topping it forms when reconstituted.

Whole milk has also been dried for years, but poor dispersibility and oxidation of the fat and other factors affecting flavor have limited use of the product to cooking and food processing. In recent years USDA scientists and engineers have been working to develop a true beverage-quality dried whole milk. The product they are working toward will disperse instantly in cold water and retain the flavor of fresh milk, not only when first made, but after the powder has been stored for months.

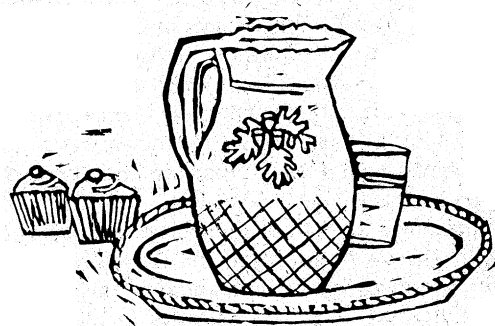
Packed in nitrogen or nitrogen-hydrogen mixtures, the milk powder will keep under refrigeration for about six months. Consumer and marketing tests have indicated a good level of acceptance. When freshly made vacuum-dried whole milk is reconstituted, most people cannot distinguish it from bottled milk.

The possibilities for dry whole milk are exciting. While the average housewife may not prefer to use it

exclusively, she may appreciate having a supply of milk on hand for emergencies. Undoubtedly the product would also be very popular with campers and sportsmen. To the extent that it could be marketed at a profit for at least a few cents less per quart equivalent than fresh milk, it may improve nutrition in economically depressed areas by making milk available at lower cost. Thus, the future availability of dry whole milk promises to increase over-all milk consumption rather than to provide a substitute for fresh milk.

Tomorrow's Dairy Products

The dairy case in tomorrow's supermarket will contain much more variety than one finds today. In addition to the potential products discussed in this article



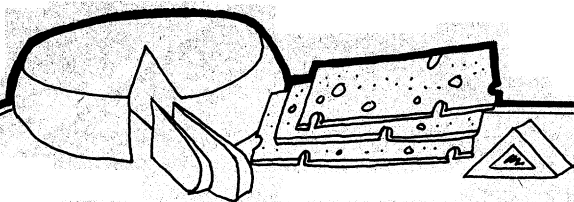
one can expect to see whole families of new dairy products. Some of the cultured milk products now being worked on include yoghurt homogenized to produce a fluid somewhat thicker than buttermilk; lactic buttermilk-type beverages with a variety of flavors achieved by citric, carbonic, and alcoholic fermentations; and cultured cream which, although costly, would have an exceptionally fine flavor.

Consumers may expect to find a large variety of ice cream novelties. Ice cream has become such a commonplace food that undoubtedly producers will be constantly creating new forms to hold consumer interest. Frozen milk fat toppings may be appearing to compete with today's products made with vegetable fats. Although more expensive, the milk fat toppings should still be moderate in cost and have an excellent flavor.

There may be some sherbets made from cottage cheese whey. Sherbet seems to be a logical product for this highly acid whey because of the stability of its protein with acid fruits. Sherbets of smooth body and good milk flavor have been made using liquid whey instead of water.

A variety of sterile, aseptically packaged dairy foods will likely be on tomorrow's supermarket shelves. Products like puddings, butter or cheese sauce, coffee cream, eggnog, chocolate drinks, infant formulas, and ice cream mix are all promising. In general, their cost will be relatively high, but they will offer the delectable flavor of milk fat and with real stability against spoilage.

Hopefully, the United States, the world's leading milk producer, will soon become one of the world's leading milk-consuming nations. The health and well-being of all our people will be improved as the place of milk in the American diet is expanded.



Freezing Cheese

BY DOROTHY HOLLAND

A QUIET REVOLUTION is taking place in the home kitchen. Not too long ago the refrigerator replaced the cupboard as the major food storage area. In recent years, however, homemakers have lightened the load on their refrigerators by turning their attention to the freezer. The home freezer is now being used as a supplementary storage pantry for almost every food imaginable.

In our company kitchens, we keep in close contact with consumers to determine trends in cooking, storage and shopping habits. We find they are very interested in the array of cheeses available in today's market. They like to buy a wide variety and keep it on hand. Naturally, they look to their freezers for the answer to their storage problems, but very little information on cheese freezing has been available.

We undertook a six-month research project using our natural and process cheese products to determine how long each cheese could be frozen and how each could be used when thawed. In all, 51 varieties of cheese were frozen. Enough multiple samples were also frozen so that each of the varieties was represented at every evaluation during the six months, yielding a total of 1380 cheese samples frozen. We tried to make sure that samples of each cheese began the test with the same freshness and quality.

Two procedures were followed. All 51 varieties were frozen whole, or unopened, in their natural packaging (glass jar, metal container, foil or plastic wrap) with no additional outer wrap applied. Extra samples of many of the larger process and natural cheeses that are sold in one-half to two-pound loaves, wedges, sticks or rounds were also cut into smaller portions and frozen in two common household food storage wraps: plastic bags with twister seals and aluminum foil.

The test was carefully conducted under home conditions with home equipment in order to closely simulate the consumer situation. The cheese samples were frozen at home freezer temperatures (0°F. to 4°F.) and thawed in the refrigerator at the recommended temperature range (38°F. to 40°F.) for 24 hours before evaluating. Natural chunk cheeses were removed from the refrigerator one hour before tasting, since natural cheese should be served at room temperature. The shelf stable cheese products (those that don't require refrigeration before opening) were thawed at room temperature 24 hours before tasting.

Samples were frozen one month before the first evaluation, then checked weekly. After three months of freezing, the samples were evaluated every other week up to the sixth month of freezing. Any noticeable flavor,

texture and appearance changes were observed. After each taste test, product performance was checked.

Previous research studies showed that freezing alters the cheese texture, but that the change is not harmful. We were interested in evaluating each cheese variety from a homemaker's point of view to check its suitability for eating and cooking uses.

We found that *natural Cheddar cheese* in all its forms (chunk, sliced and shredded) maintained excellent quality for a six-week period. After that, the flavor gradually faded and the texture became crumbly, making it suitable only for cooking.

Natural Swiss cheese in chunk and slices retained very good quality for a slightly longer period—six weeks to two months. With longer freezer storage, the cheese toughened and gradually changed flavor.

Leftover *small chunks of any of the natural cheeses* frozen in a well-sealed moisture and vapor-proof foil wrap held very good flavor and texture quality for a six-week period and a month in the plastic bags.

Process cheese, in general, maintained very good quality for four months. The individually wrapped food slices showed no signs of drying or flavor loss after four months of freezing. The flavor and texture of the loaf cheeses remained consistently good for the same four month period.

Cream cheese frozen with a foil overwrap retained its flavor along with excellent spreading and blending quality for a two-month freeze period. (The new rigid box requires no overwrap.)

All *shelf stable cheese products* were stored in the freezer for as long as four and one half months before flavor or consistency began to change.

We found one cheese product that does not freeze successfully—neufchatel. Even with minimum freezing, the quality was not satisfactory when thawed.

In general, we found that most cheese, unopened in the original packages, could be frozen for six weeks to two months and still maintain excellent quality. Opened packages of natural cheese could be frozen for a slightly shorter period—six weeks, while process cheeses maintained excellent quality after a four month period. The following chart serves as a quick guide to the recommended freezing periods for the major cheese groups. We found, however, that all varieties of cheese should be used fairly soon after thawing.

MAXIMUM RECOMMENDED LENGTH OF FREEZING

Small portions of natural cheese	1 to 1½ months
Natural Cheddar (all forms)	1½ months
Natural Swiss (all forms)	1½ to 2 months
Cream Cheese	2 months
Process cheese products	4 months
Shelf stable cheese products	4½ months

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